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Introduction:

Pumpkin, (***Cucurbita moshata***), prickly pear **(*Opuntia Ficus-indica*)** fruit (***Morus alba*)** and mulberry had been investigated for their antioxidant activites. Those belonging to the family that have been found to be very effective with regard to natural antioxidants. Auto fatty oxidation happened when they interact direct with oxygen this led to have negative effects on the quality of the food and the loss of value in terms foods caused by a short chain fatty acids **(Atef *et al.*, 2012)**.

Alcohals, Ketones and aldehydes as final out puts of the process of fatty oxidants - service that is responsible for a flavor the unacceptable smell there is an increasing interest in the antioxidant effects of compounds derived from plants, which could be relevant in relation to their roles in health and disease beside their nutritional value **(Mau *et al.*, 2004).**

Pumpkin fruits, the most commonly squash fruits, is orange in color when traditionally medecine as human and animal seed, on the other hand, shelf life of fresh-cut of pumpkin is very short, and it blends to deteriorate during storage. So, different ways of conserving and process into jams, puree, juice, pickles and dried **(Provesi *et al.*, 2012; Provesi and Amant 2015); Suna *et al.* (2015); Nawirska *et al.* (2016); Abou-Zaid *et al.* (2018)** reported that, mixing pumpkin with other fruits and vegetables had recently been approved to increase the organoleptic quality of these products.

Prickly pear was a species of Cactus that had of long been domesticated crop plant important in agricultural economies throughout arid and a semi-arid parts of the world. Prickly pear was shown, rich in

antioxidant compounds such as polyphenols, flavonoids, betaxanthin and Betacyanin **(Tesoriere *et al.*, 2004).** The composition, and the antioxidant achieving of the juicy pulp of four prickly pear (green ,yellow, orange and red) were characterized by a light humidity, high pH, low acidity, few amount of protein, and high amount of solid -soluble compounds **(Nadia *et al.*, 2016) and Saidani Tounsi *et al.*, 2019).**

Mulberry is a genus of flowers in plants in the family Moraceae Comprises 10-16 species of deciduo trees commonly known as mullerries, growing wild and under cultivation in many temperature world regions, mullberry leaves, bark and branches have long been used in Chinese medicine **(Orban and Ercili, 2010).** Its fruits (berries) contain various phyto chemical that have, antioxidant antimicrobial and anti-inflammatory properties **(Zheng *et al.*, 2008).** Mulberry fruits was also a traditional Chinese edible fruits that was used effectively in folk medicines to treat fever, strengthing the joints antiheptotoxicity **(Ozgen *et al.*, 2007);** anti-thrombotic **(Hassimatto *et al.*, 2005 and Yamamoto *et al.*, 2006).**

The present study aimed to study the properties of the sheet produced from pumpkin, morus and opuntia juices or their blends together. evaluate the nutritional value of the produced sheet and the suitable adding ratio of all blends evaluate the sensory evaluation of the products and the statistical analysis of the proceeding data.

Materials and Methods:

Materials:

Pumpkin, white Mulberry and Prickly Pear which, were and obtained from alocal market in Zagazig. Government, Sharkia, Egypt. August Month for both Pumpkin and Prickly Pear but in july for Mulberry.

Samples Preparation:

Fruits samples:

Experiments were washed in running tap-water and stored in refrigerator at 5^{o}C for meaning use (for 1-2 months). Pumpkin flesh was cut to 50 mm cubes pumpkin where seeds and peels were removed and its flash was blanched at 90^{o}C for 10min. without water and added sugar

(10g sugar/100g pumpkin). Pumpkin Prickly pear and mulberry samples were blended using kitchen machine to obtain their Juices as recommended by (**Kowalska *et al.*, 2008**) and then dried in electric ovens at 50°C for 40 hours in Faculty of Technologie and Devolepment, Zagazig University, Egypt.

Blends preparation:

Initially, one kind of product was prepared. Then, the juice blends preparation were carried out as follows :

1- 100% pj which was composed pumpkin juice puree .

2- 100% oj which was composed opuntia juice puree .

3- 100% mj which was composed mulberry juice puree .

4- 40% (pj) + 40% (oj) + 20 % (mj).

5- 33% (pj) + 33 % (oj) + 33% (mj).

6- 50% (pj) + 50% (oj).

7- 50% (pj) + 50 % (mj).

8- 50% (oj) + 50% (mj).

Drying process:

To prepare the produced sheets, all juices and prepared puree blends were dried in air-forced drier oven model, they were placed in thin layer sheets in the oven at 70°C for constant weight **(Kavak Akpinar *et al.*, 2006).**

Chemical analysis:

Moisture, fat, proteins, fiber ash, total soluble solids total carbohydrates (T.S.S), humidity and total phenolic content in all experimental materials and dried sheet samples were determined according to **A.O.A.C (2005)** methods.

Preparation of methanolic extract:

For estimation of total phenolic (TPC) and antioxidant activity, 2 gram of sample was extracted in 20 ml methanol over night, centrifuged at 4000 rpm and filtered.

Determination of total phenolics:

- The (TPC) was determined using the Folin-Ciocalteu's reagent **(Lee *et al.*, 2004).** To the methanolic extract 0.5ml of Folin-Ciocalteu reagent was added. The contents were mixed and added with 1 ml of saturated sodium carbonate solution, followed by adjusting the volume to 10 ml with distilled water. The mixture in the tubes was thoroughly mixed by vortexing. Tubes were allowed to stand at ambient temperature for 1 hr until the characteristic blue color developed. The control was prepared with methanol. Absorbance of the clear supernatants was measured at 675nm using a spectrophotometer.

Gallic acid was used as a standard and total phenolic content was calculated and expressed as mg gallic acid equivalent (GAE) per g sample. The total phenolic content can be calculated as natural compound (gallic acid) equivalent (GAE) by the following equation: T= C XV/M.T is the total phenolic content in mg·g–1 of the extracts as GAE, C is the concentration of gallic acid established from the calibration curve in mg·ml–1, V is the volume of the extract solution in ml and M is the weight of the extract in g. Gallic acid is used as a standard compound and the total phenols were expressed as mg/g gallic acid equivalent

Radical scavenging activity by DPPH assay:

2,2-Diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity was measured following the method **(Hatano *et al.*, 1989).** Different concentrations of extracts were taken in test tubes and the volume made up to 1ml. 4 ml of 0.1 mM methanolic solution of DPPH was added to these tubes and shaken vigorously. The tubes were allowed to stand at room temperature for 30 min. The control was prepared as above without any extract. The changes in the absorbance of the samples were measured at 517 nm. Radical Scavenging activity was expressed as the inhibition percentage and was calculated using the following formula

The HPLC analysis:

HPLC-Ms system (Agilent 1100) is composes of quaternary pump, a photodiode – array detectator UV/VIS detecator, and a single quadrupole MS detecator with ion source (ESI). Phenolic acids were separated from within min by employing a gradient mabile phase of water /acetonitrile / glacial acetic acid (980/20/5,v/v/v,PH 2.68) and acetonit/ glacial colic aud (1000/5,v) with flow rate at 3 ml / min and detection at 325 nm. **(Zheng**

and Clifford 2008) for flavonoids agradient solvent system of 1.0% formic acid solution with flow rate at 1.0 ml/min, detection at 280 nm and identification by ESI- Ms were separated within 70.min. (**Schutz *et al.*, 2005).**

Results and Discussion:

In case of pure fruits juice*:*

Chemical analyses (moisture, ash and protein, crude fibers, total carbohydrates, total soluble solids and fats) were determined. Table 1 and Table 2 showed that, pure Pumpkin juice contained high protein content (2.26%) compared with that of Prickly pear and mulberry Juices which almost have the same value, (1.90, 1.88%) respectively.

On other hand fat content of pure pumpkin and mulberry Juices was (8.20, 7.26%) respectively, while prickly pear has fat content (3.56) which almost the half % lower than other Pj and Mj.

The ash and fiber contents of PJ was higher than that of Oj and Mj, which were (4.02 , 6.45%) for Pj, (1.61 , 0.96%) for Oj. And (1.12 , 3.42) for Mj.

Fiber content of Prickely pear (0.96) and the obtained values within the range reported by **Aberoumand (2011)**.

Moisture content MJ was 28.20% lower than of Pj and OJ. Being (41.48 , 39.14%) respectively, Which indicated that pure mulberry juice was safe for long period storage without spoilage, because, generally, low moisture content are not highly susceptible to microorganisms attack **(Ajayi *et al.*, 2006).** It was showed that the prickely pears moisture, ash, protien, fibres, total carbohydrate, and lipid was (39.14 , 1.61, 1.90,0.96 , 38.81 and 3.56% which dis agree with **Piga (2004); Lester and Hodges (2008)**.

The moisture and ash contents obtained by **Kim *et al.*(2011)** is higher than which obtained from Pumpkin this finding which reported in the range from 84% to 96% moisture content and 0.34% to 1.05% ash content depending on the variety of pumpkins

The total soluble solids (T.S.S.) in pure Juice of pumpkin was nearly high in pumkin juice (17.09%) than in Oj and MJ (14.02, 15.9%) which nearly the same.

The results of T.S.S of prickely pear juice was 14.02% these results agreement with **El-Samahy *et al*., 2006; Cassano *et al*., 2010.**

T.S.S content of pumpkin was obtained in this study (17.09 %) was comparable with **Sudhakar *et al.* (2003)** who showed large variation in the TSS content of pumpkin. Also, **Linghong *et al*., (2012)** found similar values of TSS (12.5 - 14.7%) in white mulberry fruits. Total carbohydrates content in pumkin was 20.5% which lower than of Mj (42.22%) and Oj (38.81%) which in the same range almost.

From the results given above for pure juice of Pj , Oj and Mj it was conclude that, Pj has high protein ,fat and T.S.S contents as compared with OJ and MJ, while MJ has high carbohydrates and low moisture content than the other and nearly has fat content as Pj.

The results indicated that pumpkin and mulberry juices were rich source of fiber and ash therefor, the proportion of fiber and ash in the mixtures of them. The results also showed adecreas in the percentage of total carbohydrates in pumpkin, which make it appropriate rich diet could reduce blood glucose. Due to the higher content of outi oxidant flavonoids which obtained by HPLC which showed that, the higher content of isoflavonoid and ellagic acid destroy the excess of suger. Similar results were obtained by **Zhazo *et al*., (2014) and Tin *et al*., (2013).**

Table (1): Chemical composition of the prepared pure juices

Samples	1 Pumpkin (Pj)	2 Prickly Pear (Oj)	3 Mulberry (Mj)
Protein	2.26	1.9	1.88
Fat	8.2	3.56	7.26
Ash	4.02	1.61	1.12
Fiber	6.45	0.96	3.42
Humidity	41.48	39.14	28.2
T.S.S	17.09	14.02	15.9
Carbohydrat	20.5	38.81	42.22

Table (2): Chemical composition of the prepared blends sheet

4 40Pj + 40Oj + 20Mj	5 33Pj + 33Oj + 33Mj	6 50Pj + 50Oj	7 50Pj + 50Mj	8 50Oj + 50Mj
2.78	3.24	1.99	3.11	3.59
9.1	11.47	11.19	10.14	11.11
1.37	1.36	1.22	1.72	1.53
2.59	4.19	2.51	4.75	5.87
43.79	41.92	39.49	39.11	29.27
14.8	15.09	16	16.02	15.8
25.57	22.73	27.6	25.15	32.83

Case of pure juice:

Phenolic compound:

Table (3) evidence that**,** the main phenolic compounds identified in case of pue pumpkin juice wasconcen (Ellagic, caffeic acid and gallic acid) with concentration of (13.6 , 8.12 , 26.4mg/ml) respectively, gallic acid were higher phenolic acid than other. While the prichely pear pure juice also contain the same phenolic compounds that was identified in case of pumpkin with concentration of 10.2 , 7.32 and 28.6mg/ml for ellagic, caffiec and gallic acid, respectively. It was found that gallic acid concentration were almost the same for both pumkin and prickley pear, as shown in table (3).

From our results it was found that gallic acid has highest concentration for pumkin and prickely pears and also in mulberry juices but in low concentration which play a role in antioxidant activity and this agreed with **Kim *et al*.** (**2012).**

In case of Mulberry there was phenolic profile that was difference from the other juices, the ellagic acid was disappeared while the two other phenolic compounds (caffeic and gallic) was still found but in smaller concentration (15.2 and 8.5mg/ml) respectively. The phenolic compound such as resorcinol, disagree with **Gundogdu *et al.* (2011).**

Case of juice blend phenolic compounds:

In juice blend there was a phenolic profile which was different from all blends. In case of 40% PJ +40% OJ +40% MJ. The main phenolic compounds identified were ellagic acid, coumaric acid, caffeic acid and

querestin (10.24 , 9.97 , 28.66 and 8.56mg/ml) respectively, the highest phenolic concentration was found with caffeic acid, while ellagic acid which was predominant in pure Pj and Oj and Mj was still appear in phenolic profile by almost the same concentration, this these results was agree with **Gundogdu *et al.* (2011)**.

From Table (4) 33% Pj + 33% Oj +33% MJ the phenolics compounds detected were catchein , ellagic , gallic and sinnapic acid by concentration of 5.2 , 6.1, 8.02 and 11.02mg/ml respectively, the profile was different the catchein and sinnapic acid appear which not appear in othe juice blend, with sinapic acid in high concentration followed by gallic acid . Our results are different to those reported by **Memon *et al.* (2010).**

Table (3): Phenolic compounds of blending sheets

Compound	Concentration mg/ml							
	Sheet NO.							
	1	2	3	4	5	6	7	8
Resorcinol	00.00	00.00	4.22	00.00	00.00	20.04	14.6	14.60
Ellagic acid	13.60	10.20		10.24	6.14	4.11	00.00	00.00
Caffiec acid	8.12	7.32	15.2	28.66	00.00	2.01	4.20	4.20
Gallic acid	26.40	28.60	8.50	00.00	8.02	2.00	1.02	35.02
Coumaric acid	00.00	00.00	00.00	9.97	00.00	00.00	00.00	00.00
Quercetin	00.00	00.00	00.00	8.56	00.00	00.00	00.00	19.55
Catechin acid	00.00	00.00	00.00	00.00	5.22	00.00	00.00	00.00
Sinapic acid	00.00	00.00	00.00	00.00	11.02	00.00	00.00	28.15

Table (4): Phenolic content in juice blend extracts

Item	Concentration mg GAE/g
100 % PJ	0.05
100 % OJ	11.88
100 % Mj	15.14
40 Pj +40 OJ + 40 Mj	2.33
33Pj +33 OJ + 33 Mj	0.001
50 Pj +50 Oj	1.05
50 Pj +50 MJ	1.25
50 OJ +50 MJ	17.02

In case of blend contain pumkin and prickely pears in 50 % for each the phenolic profile again obtain the same profile nearly the same of pure pumpkin and pure prickley pears Table (4), in addition to resorcinol which appear in high concentration, with gallic acid low concentration. The phenolic profile was (ellagic, caffeic, resorcinol and gallic acid) with concentration of (4.1 , 2.0 , 20.0 and 2.0).

In case of blend from 50% of pumkin and mulberry for each, the phenolic profile was (caffeic, resorcinol and gallic acid) with concentration of (4.2 , 14.6 and 1.0), this profile was the same of 50 % Pj + 50 % Oj. Finally in case of 50 % prickely pears + 50% mulberry, it was found that phenolic profile was greately difference, consist of (caffeic, resorcinol, sinapic, gallic acid and querestin) in concentration of (4.2 , 14.6 , 28.1 , 35.0 and 19.5) respectively, Here It was found that gallic acid highest concentration followed by sinapic and querestin, in this blend was agree with oure results in TPC it was found that (17.02) mg GAE/g.

1- Total phenolic:

The total phenolic contents of eight juice blends extracts as determined by Folin-Ciocalteu method are reported as gallic acid equivalents (Table 5). Total phenolics of different juice blends extracts in the combination of 50% OJ and 50% MJ extracts has significantly the

highest amounts of total phenolics 17.02 mg gallic acid equivalents (GAE)/g DW. The phenolic compounds values of Pure juice 100% Mj and 100% OJ extracts was significantly had phenolics content which almostely near the value of mixture of 50 % OJ and MJ which are as follow 15.14 and 11.88 mg GAE/ 1g DW, respectively .

On other hand other mixture blend had lowest phenolics content as follows 2.33, 1.25, 1.05, 0.05 and 0.001 mg gallic acid equivalents (GAE) / g DW) for (40% Pj +40% OJ + 40 %Mj), (50% Pj +50% MJ), (50% Pj +50% Oj) , (100 % PJ) and (33%Pj +33% OJ + 33% Mj) Respectively. The obtained data indicated that the highest TPC was found in blends composed of 50% Optunia juice +50% Morus juice on similar 100% Morus juice alone and 100 % Optunia Juice had less or equal. Whereas, 100% pumpkin juice sheet possessed a lower TPC.

2- Antioxidant activity:

Antioxidant properties, especially radical scavenging activities, are very important due to the deleterious role of free radicals in biological systems. The reduction of 1,1,-diphenyl-2- picrylhydrazyl (DPPH) absorption is indicative of the capacity of the sample to scavenge free radicals. The purified enzyme exhibited antioxidant activity hence they able to reduce the stable (DPPH) to the yellow colored diphenyl-picrylhydrazine Figs. (1-8).

Table (5) and Fig. (1) to Fig. (8) showed IC_{50} value for eight juice sample. The DPPH radical-scavenging activity was dependent on the concentration of extracts; it increased significantly and gradually with increasing concentration of extracts from this table it was noticed that the DPPH radical scavenging ability of 50% OJ and 50% MJ, 100% Mj and 100% OJ showed excellent DPPH radical scavenging activity that was enhanced with increasing concentration. The IC_{50} value was 0.30 and 0.33 mg/dl, respectively as compared with 0.11 mg/dl for ascorbic acid standard.

Phenolic compounds were widely distributed in fruits and vegetables **(Li *et al.*, 2007**) which have received considerable attention because of their potential antioxidant activities and free radical-scavenging abilities, which potentially have beneficial implications in human health **(Lopez *et al.*, 2003)** and **(Govindarajan *et al.*, 2007).**

Phenolic compounds provide antioxidant potential and health-promoting properties and contribute to the flavour and colour attributes of fruits and vegetables **(Kaur and Kapor, 2001).**

There is a direct relationship between the phenolic content and antioxidant capacity of plants. They are known to constitute one of the most important groups of natural antioxidants due to their diversity and extensive distribution. They possess biological and chemical properties which include; reducing character, capacity of sequestering reactive oxygen species and several electrophiles, chelating metallic ions and capacity for modulating the activity of some cell enzymes **(Al- Mamary *et al*., 2002).**

Table (5): Antioxidant activity in IC_{50} for tested juice blend extracts

Sample	IC_{50} (mg/dl)
100 % PJ	0.96
100 % OJ	0.42
100 % Mj	0.335
40 Pj +40 OJ + 40 Mj	0.446
33Pj +33 OJ + 33 Mj	1083.0
50 Pj +50 Oj	0.883
50 Pj +50 MJ	0.558
50 OJ +50 MJ	0.301

From our results the Juice blend obtained from optunia juice and morus Juice by 50% for each had high total phenolics content which were similar or higher than pure morus sheet and pure optunia sheet as compared with pure pumkin juice which has lowest total phenolic contents and very low DPPH scavenging activity.

This study showed that the antioxidant efficiency of pure morus juice and pure optunia Juice was similar or less more from 50 % blend may be attributed, in a significant part, to their total phenolic contents **(Rapisarda *et al*., 1999)**.

In a similar comparative study of homemade and commercial grape juice by **Burin *et al*. (2010)**. The correlation coefficient reported between

TPC and DPPH was 0.957 which was higher than the values obtained in the present study; this indicated that phenolic compounds were the main contributor to antioxidant activity in terms of radical scavenging and ion reducing ability

The obtaind results showed that, pure pumpkin juice sheet and its blend with other juice from morus and optunia has almost very low total phenolic content and antioxidant activity which may due to its high ascorbic acid content 0.11mg/dl in pure pumkin juice according to **Kahkonen *et al*. (2001).** Ascorbic acid could exert a synergistic effect with phenolic components DPPH radical scavenging activity is one of the most widely used method for screening the antioxidant activity of plant extract. The radical scavenging activities of the extracts were determined by using DPPH a stable free radical. 1, 1-diphenyl-2-picrylhydrazyl is a nitrogen centered free radical, color of which changes from violet to yellow on reduction. The degree of discoloration indicates the scavenging potentials of the extracts.

They were often expressed as IC_{50} which is the concentration of the sample required to scavenge 50% of the free radicals present in the system. A lower IC_{50} 1.03 value indicates a high radical scavenging ability.

As the concentration of phenolic compounds or degree of hydroxylation of the phenolic compounds increases DPPH radical scavenging activity increases and with it antioxidant activity **(Sultana *et al*, 2008).**

In our results it was found that the juice blend obtained from optunia juice and morus Juice by 50 % for each had highest antioxidant with IC_{50} 0.30 followed by pure morus juice and pure optunia juice with IC_{50} (0.33) and (0.42), respectively.

These results agree with **Andallu *et al.*, (2009)**,where morus plants contains many active compounds which acts as an antioxidant like polyphenols, carotenoids and vitamin A, C, E, which, found that these compounds increase the body's antioxidant status.

Interestingly, we observed that the *Optunia dillenii* and *Optunia ficus indica* fruits The antioxidant activity of phenolic compounds is mainly due to their redox properties, which can play an important role in

adsorbing and neutralizing free radicals, quenching singlet and triplet oxygen, or decomposing peroxides. **Javanmardi *et al.* (2003)** found that juices presented a strong antioxidant activity (IC50 = 8,18 and 13,20 µl/mL respectively), about three times higher than this of O. dillenii oil and two times higher than this of ascorbic acid.

Abd El-Razek *et al.* (2017) reported that the DPPH scavenging activity of 50 (µl/ml) of *O. ficus indica* fruit Juice presented a low value (19.34). In contrast, in our investigation, Optunia Juice was highly active, the antioxidant activity attained 32.17 % for only 5 µl/mL. While Pure pumkin juice has lowest antioxidant activity than other blend, where as when mixed pumkin juice (PJ) with other blend the antioxidant activity increase slightly than pure pumkin as follow 40% Pj +40% OJ +40% MJ as compared with pure OJ with IC50 0.44 , 0.33 respectively. thus we can say pure pumkin juice alone less acceptable otherwise when blend with other juice especially pure morus juice which give high antioxidant activity.

Summary and Conclusion :

The aim of this study is to make slices of fruit juices and their mixture as the life span of this fruit is short. It contains nutrients and anti-oxidants. Therefore, a different preservation method was searched for the use of these juices and turn them into slides so that they can be retrieved again in the form of juices.

The chemical composition and the total content of phenols and antioxidants were studied. The results demonstrated that there is a direct relationship between the phenol content and the antioxidant, natural oxidation.

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دراسات كيميائية تكنولوجية لشرائح من عصائر القرع العسلى والتين الشوكى والتوت

الملخص:

كان الهدف من هذه الدراسة عمل شرائح من عصائر الفاكهة حيث أن العمر الإفتراضى للفاكهة قصير وهى تحتوى على عناصر غذائية ومضادات أكسدة، وكذلك تم البحث عن طريقة حفظ مختلفة للاستفادة من هذه العصائر وتحويلها إلى شرائح حيث يمكن استرجاعها مرة أخرى فى صورة عصائر. وتم دراسة التركيب الكيميائى للعصائر وتقدير المحتوى الكلى للفينولات ومضادات الأكسدة حيث أثبتت النتائج أن هناك علاقة مباشرة بين محتوى الفينول والقدرة المضادة للأكسدة فى العصائر وهى تشكل أحد أهم مجموعات مضادات الأكسدة الطبيعية.